NOTE ON THE SPECTRUM OF BRORSEN'S COMET

On April 1 and 2 I succeeded in determining the position of the green band in the spectrum of Brorsen's comet. The spectrum was so faint that the other bands could not be measured. The instrument was the 9½-inch equatorial of our astronomical laboratory, armed with a one-prism spectroscope. The observations were made by bringing an occulting bar, movable by a micrometer screw, into such a position that the well-defined lower (less refrangible) edge of the band in the comet spectrum should be just visible as a thin line, the rest of the band being hidden by the bar. After the pointing the flame of a Bunsen burner was brought in front of the slit, and the position of the band in the comet-spectrum was thus fixed.

It was found by four independent pointings (which all agreed within about the interval of the *b*-lines) that the central band of the spectrum of the comet coincided precisely (within the limits of perception) with the green band in the flame of the hydrocarbon.

The interest of the observation lies entirely in the fact that it seems irreconcileable with the result obtained by Mr. Huggins in 1868, who found for the same comet a spectrum having bands distinctly different in position and appearance.

According to my observation, the spectrum of Brorsen's comet no longer stands out as exceptional, but agrees with that of other comets.

The comet itself appears in my telescope as a small round nebulosity, about 40″ in diameter, without definite nucleus, but much brighter in the centre, easily visible in the finder of 3 inches aperture, and about equal in brightness to a star of the 7th or 8th magnitude. Before the new moon a straight narrow tail, about half a degree long, was faintly visible with a low power.

C. A. YOUNG

Princeton, N. Jersey, U.S.A., April 5

NOTES

WE learn that Congress has sanctioned the scheme for the reorganisation of the American Surveys recently commented upon in these columns. It is understood that the Geological Survey will be placed under the control of Mr. Clarence King, who has so long had charge of the Geological Exploration of the 40th Parallel. But no details have yet reached us.

IN the Paris Academy of Sciences, M. Alphonse Milne-Edwards has been elected a member in place of the late M. Gervais, in the Section of Anatomy and Physiology; M. Abich a correspondent in the Section of Mineralogy, in place of M. Damour; and Mr. Lawes a correspondent in the Section of Rural Economy, in place of the late Marquis de Vibraye.

THE following are the probable arrangements for the Friday evening meetings at the Royal Institution after Easter:—April 25. Francis Galton, F.R.S.: "Generic Images." May 2. Prof. John G. McKendrick, M.D.: "The Physiological Action of Anæsthetics." May 9. Sir John Lubbock, Bart., M.P., F.R.S.: "The Habits of Ants." May 16. Prof. A. Cornu: "Étude Optique de l'Élasticité" (in French). May 23. W. H. Preece, M.R.I.: "Multiple Telegraphy, or Duplex and Quadruplex Telegraphy." May 30. Grant Allen: "The Colour-Sense in Insects; its Development and Reaction." June 6. Prof. Dewar, F.R.S. June 13. Frederick J. Bramwell, F.R.S.: "The *Thunderer* Gun Explosion."

A CATALOGUE of the library of the Museum of Practical Geology and Geological Survey has been lately published, compiled by Messrs. H. White and T. W. Newton, which cannot fail to be of use beyond the walls of the library of which it is a record. The arrangement is alphabetical, the author's name and important groups of works, as "Geological Surveys" and "Statistics," being printed in black thick type, secondary titles and subdivisions in italics. The pages are clear and easily read and the titles full and accurate. The price, considering that there are over 600 pages, and that only 270 copies appear to have been printed, is somewhat less than that which is generally fixed on the publications of this Department. When the Geological Survey was instituted in 1843, its first Director, Sir Henry De la Beche, C.B., commenced the formation of a museum illustrative not only of the palæontology of the country, but of the economic application of geology to the arts and manufactures. These collections were exhibited in a small building in Craig's Court, and wishing still further to foster geological study, Sir Henry presented to the Survey the whole of his scientific library. This was added to from time to time, until in 1851 these collections were removed to the Museum of Practical Geology, which was built for their reception, and to provide accommodation for the Royal School of Mines, which was then instituted, and to a certain extent associated with the Survey. Since this time, partly by the annual grant from Parliament, partly from the gifts of the various scientific societies of the world, and partly by the bequest of the late Sir Roderick Murchison's library, it now numbers no less than 28,000 works, on the special subjects taught in the School of Mines, geology, mining, chemistry, biology, &c., and it is specially rich in foreign transactions, and the works of reference useful to a mining engineer.

LORD DUFFERIN, who had accepted the presidency of the Birmingham and Midland Institute, having been compelled to relinquish that office on his appointment to the Embassy at St. Petersburg, Prof. Max Müller was communicated with by the Council, and has signified his acceptance of the post.

THE publication of weather warnings in Switzerland will begin on May 1 in Zurich, and on June 15 in Geneva. A telegraphic despatch, containing a description of the weather in Europe, with weather warnings, will be sent from the observatory every day, by telegraph, to any person who will pay quarterly 4*l.* 8*s.*, and a shorter bulletin containing only a weather prognostic, will cost 1*l.* for three months.

SWISS papers are much alarmed by a case of infection by birds. Two brothers, merchants at Uster, in the canton of Zurich, who have a large collection of various birds and monkeys, lately received some tropical birds which were sent in a cage from Buda-Pesth. Immediately after the arrival of the birds the two brothers, the wife of one of them, and a shop-girl became sick. A third brother, who is a surgeon, understood the cause of the illness and ordered all suspicious birds to be killed, fifty or sixty in number, the cages to be destroyed, and a strong sanitary cordon around the house to be established. A tinker who had done some repairs to the cages also became sick and died in hospital, as well as an innkeeper and his wife, at whose inn the birds stayed for some days. The number of sick already has reached eight, and their state is very bad. The illness is described as a black typhus.

THE third fascicule of the "Pflanzenleben der Schweiz," by M. Christ, has just appeared, and contains a very fine map which illustrates the subdivisions of the Swiss flora.

A COMMITTEE has been appointed by the Paris Society of Photography to collect funds in order to erect a statue to Nicephore Niepce, who was born at Chalons-sur-Saone in 1765. The subscriptions are to be sent in Paris to M. Pector, 9, rue d'Albe, or M. Koziell, 20, rue Louis-le-grand.

MR. CLIFTON WARD's papers on the physical history of the English lake-district have been reprinted in a separate form from the *Geological Magazine*.

M. MARIE DAVY, the director of Montsouris Meteorological Observatory, has set up a registering Thomson electrometer. The indications are recorded by photography in accordance with the system which has been established at Kew by the British Association. A comparison of readings taken by these two establishments will render essential services to the progress of meteorology. M. Descroix, the observer in charge of this instrument, was assailed before the Meteorological Society by a French *savant* who has invented another electrometer, in which the registration is taken with a pencil and mechanical force. But the discussion proved that such instruments are useless without knowing whether their indications are worth being recorded, as many objections can be raised against their use and have been published by competent electricians.

THE French artists are preparing for an Exhibition of Fine Arts, to be held as usual in the Palais de l'Industrie from the beginning of May. When this exhibition is over a scientific exhibition will be organised by M. Nicolle, the successful organiser of the Exposition Maritime et Coloniale held in the same building in 1877. M. Jules Simon, M. du Moncel, and others are taking an active part in the preparations. The chief peculiarity will be the execution of all the scientific experiments capable of being made before an audience and on an unusual scale. The organiser will try to fill the lacuna, which was so much complained of in the last Champ de Mars exhibition.

A CORRESPONDENT of the *Hiogo News* mentions that in the city of Kioto there are to be seen many semi-foreign buildings which are the Shogakko, or elementary schools. Of these there are 64 in the city, and 445 in the whole *fu*. Kioto is divided into two large districts, called Kami and Shimo Kiyo, which are subdivided respectively into 33 and 32 *ku*. Each *ku* is obliged to establish and maintain one of these schools, except in the case of poor *ku*, when two are allowed to unite and form one school district. Besides the usual Japanese course of studies, the pupils are taught the elements of foreign mathematics, history, geography, and philosophy, and they are also trained in gymnastic exercises. Education is compulsory, only those (who are of age) being exempted who are necessary to the support of their parents.

WE learn that the organisation of the captive balloon has been altered by M. Giffard. The aëronautical and scientific staff has been constituted by him into a private company. He has placed at their disposal the funds required for the working of the balloon, and placed the enterprise in their own hands on their own responsibility and care. This arrangement has been agreed to by the public authorities, and will leave a handsome surplus on behalf of the men who spend their lives in the aëronautical career, as a large part of the profits, exclusive of a handsome weekly pay, is to be divided by equal part amongst them. A few important alterations have been made in the car, and ring, and netting. The net ascending power will be enlarged by a ton. A kind of india-rubber gas-meter, containing 100 cubic metres, has been constructed, in order to render inflation instantaneous between two ascents.

THE Académie des Ascensions Météorologiques opened its Museum in Paris on April 3. More than 600 persons visited the gallery. It is to remain open every Thursday, and any day admission may be obtained by letter to the General Secretary, 50, rue Rodier. The number of exhibitors exceeds 120. Amongst the collection of aëronautical medals we note some commemorating ascents made in England in the end of the last century. A registering barometer for ascents to 5,000 metres is exhibited by MM. Richard frères; it was purchased by the government for the Meudon aëronautical establishment. M. Egasse exhibits an apparatus for filling balloons with hydrogen extracted by the action of zinc and chlorhydric acid. The result of the reaction is employed in large quantities for destroying miasmatic influence in barracks and other similar establishments. A new paddle has been constructed for ascending and descending without gas or ballast when the balloon has been placed on equilibrium with surrounding air, a new guide rope for diminishing the velocity by friction when the balloon is travelling at sea, a safety-car for these perilous occasions, differential valves, &c. Lectures will be delivered and ascensions executed by the members of the institution.

THE *Cologne Gazette* reports, under date the 9th inst., a slight shock of earthquake at Buir and Elsdorf. The shock is stated to have been noticed at five minutes past midnight. It had a rolling noise and took an east-south-easterly direction.

THE *Tiflis Messenger* says that a strong earthquake was felt on March 27 in Persia, at the Gulf of Miama.

A GENERAL exhibition of the various systems and apparatus used for electric lighting is to be held in the Royal Albert Hall in May. An inaugural lecture, at which the Prince of Wales has promised to be present, will be delivered in the evening of Wednesday, May 7, by Mr. W. H. Preece.

AS an agitation prevails in France against the laws proposed by M. Ferry for prohibiting the members of unauthorised bodies from taking any part in public instruction, it is very likely that Government will retain the exclusive right of conferring degrees, but the proposed restrictions will be rejected by Parliament.

THE following details (published by Herr Landauer in the *Reports* of the Berlin Chemical Society) regarding the behaviour of safranine when spectroscopically examined, may interest the readers of our recent article on "Absorption Spectra" (vol. xix. p. 495). It is well known that the salts of safranine show the remarkable reaction that the red colour of their solution turns into violet, indigo-blue, bluish green, and finally emerald green, upon addition of concentrated acids, particularly of sulphuric acid. The change of colour takes place in the opposite direction if safranine is dissolved in strong acids and water is gradually added to the solution. If these solutions are examined with the spectroscope, then it appears that each of the colours mentioned shows a separate spectrum. The green solution absorbs the violet, blue, and red rays, the bluish-green one behaves in the same way, but lets a part of the red rays pass; the blue solution absorbs only the yellow rays, and the more the colour of the solution turns violet and red through the addition of water, the more the absorption passes over to the green part of the spectrum. Herr Landauer attempted to determine the cause of these changes of colour in the liquid, and the corresponding alteration of the spectrum. Finding it difficult, however, to isolate the various chemical compounds formed in the liquid, it was only possible to try an explanation from the chemical behaviour of the liquid itself. Finally he arrived at the conclusion that of the two possibilities, formation of different acid salts, or of different hydrates of the same salt, the latter is the more probable one. The change of colour takes place also when the solution is evaporated, and reappears in the opposite direction when water is again added. The sulphate is the most characteristic salt of all; blotting-paper impregnated with a solution of this salt, and dried by heating until it has become green, soon becomes blue by attracting moisture from the atmosphere, and a drop of water thrown upon it instantly gives a red stain with a blue margin. Herr Landauer supposes that there exist three different hydrates (or two hydrates besides an anhydrous salt), which are red, blue, and green respectively, the violet and bluish-green tints resulting from mixtures of these. Herr Vogel's maxim, therefore, that the rule "each body has its own spectrum" can be admitted only with restrictions, may be still further restricted, inasmuch as it may be asserted that absorption spectra only indicate the component parts of a compound so long as the colour of a given substance is characteristic of its chemical composition.

WE notice an interesting discussion which arose at the last meeting of the Russian Society of Hygiene. M. Malarevsky, pointing out the yearly increasing myopy of scholars, proposed to print books with white letters on a black field, and proved the superiority of this system by experiments he has made with fifty scholars, as well as by experiments on the facility of discernment of black drawings on a white field and of white drawings on a black field, these last always being better seen from a greater distance than the former.

WE have received a very full Catalogue of Official Reports upon Geological Surveys of the United States and Territories and of British North America, by Mr. F. Prime, assistant-geologist of Pennsylvania. It seems to be an enlarged continuation of the Catalogue by Prof. O. C. Marsh, published in the *American Journal* for 1867. The present list covers 50 pp.

AT the last session of the U.S. Congress an appropriation of 250,000 dols. was made for the construction of a fire-proof building for the reception of such collections belonging to the National Museum as cannot be at present accommodated in the Smithsonian Building; and as the plans have already been prepared, it is understood that the work will be begun without delay. The design contemplates a building 301 feet square, with certain projecting corners, the whole covering a space of about 97,000 square feet. Although not quite equal to the area of the Government Building at the Centennial, it is capable of containing a much larger mass of material. The general plan is that of a pavilion, of one story, with brick walls and iron roof, the floor to be of concrete. The corner buildings or projections constitute offices connected with the administration of the Museum, to include a library room, a small lecture-room, and others. It is expected that the entire edifice will be completed and ready for occupation by April 1, 1880.

THE whale whose bones have been so long exposed in the court-yard of the Jardin des Plantes at Paris, is to be demolished in compliance with a report from M. Quatrefages, who shows that the original number of vertebræ has been enlarged, and a series of important alterations have been successively made.

THE publishing office of *Science News*, hitherto published at Salem, Mass., will shortly be removed to New York.

MANY of our readers might like to know of Dr. Karl Möbius' address on March 5 last, on his assumption of the rectorship of the University of Kiel. Its subject is the passage from Goethe—"Leben ist die schönste Erfindung der Natur, und der Tod ist ihr Kunstgriff viel Leben zu haben."

THE Second Annual Report of the Board of Trustees of the Western Pennsylvania Institution for the Instruction of the Deaf and Dumb is one of great interest, and we are sure would be perused with pleasure and profit by all who are interested in the important subject. The Institution seems to be conducted on thoroughly scientific principles, and its success seems very marked. The Report is published by Stevenson, Foster, and Co., Pittsburgh.

WE have received a cheap edition of "The Caves of South Devon and their Teachings," by Mr. J. E. Howard, F.R.S., in which he endeavours to combat the long chronology assigned to the human race by Mr. Pengelly and others. Hardwicke and Bogue are the publishers.

THE *North British Daily Mail* of March 29 contains reports of recent meetings of the Geological and Natural History Societies of Glasgow. In the former Mr. Young gave a descriptive notice of an interesting specimen of *Elephas primigenius* discovered about four years ago when sinking a pit-shaft on Mainbill Farm, near Baillieston, east of Glasgow. In the latter Mr. Harvie-Brown read a paper on the Mammalia of the Outer Hebrides.

"NEW Views in Astronomy, illustrated by Working Models and Diagrams, and Demonstrated by Inductive Philosophy," is the title of a quarto pamphlet by Mr. John Harris, published by Wertheimer, Lea, and Co., of Finsbury Circus.

THE additions to the Zoological Society's Gardens during the past week include a Yak (*Bison grunniens*) from Bhootan, presented by the Hon. Ashley Eden, K.C.S.I.; a Japanese Goat Antelope (*Capricornis crispus*) from Japan, presented by Mr. H. Pryer, C.M.Z.S.; a Rhesus Monkey (*Macacus erythræus*) from India, presented by Mr. J. Roberts; a Grivet Monkey (*Cercopithecus griseo-viridis*) from West Africa, presented by Mr. W. B. Greenfield; a Common Seal (*Phoca vitulina*), British Isles, presented by Capt. Chas. Rawle; a Red-throated Diver (*Colymbus septentrionalis*), British Isles, presented by Mr. J. S. Thompson; a Masked Parrakeet (*Pyrrhulopsis personata*) from Fiji, an Entellus Monkey (*Semnopithecus entellus*), from India, deposited.

THE RESULTS OF RECENT RESEARCHES IN ANIMAL ELECTRICITY[1]

I.—INTRODUCTORY OBSERVATIONS

The State of the Subject Ten Years Ago

UNTIL the year 1867 certain theoretical conceptions based upon the classical investigations of du Bois-Reymond prevailed in the whole department of animal electricity. It may indeed be said that du Bois-Reymond created this branch of modern physiology, for it was he who first struck out the modern method of research and gave the lead to recent investigation. To his individual labours we owe not only the establishment and the orderly arrangement of many facts which had been left ill-defined by his predecessors, but also the actual discovery of a still greater number of fundamental value. These fundamental facts, briefly summarised, were the following:—

1. Muscular fibres and nerve-fibres when cut across exhibit a current directed within them from the transverse to the longitudinal surface, the electromotive force of which may equal one-twelfth of a Daniell's cell.

2. The negative potential of the transverse section also belongs, though in a less degree, to the natural terminations of the fibres of muscle ("natural transverse section"); but in this case it may be wanting, or even be changed to a positive potential. This diminution, absence, or reversal, of the common condition, to which the term "parelectronomic state" is applied, would seem to be favoured by the continued action of cold.

3. If a certain portion of a nerve-fibre be traversed by a galvanic current, the remaining portions, or the extra-polar regions, become the seat of an electromotive force which has the same direction as the traversing current, and which is strongest in the vicinity of the poles (electrotonus). This influence extends only so far as the structural integrity of the fibre is complete.

4. Muscles and nerves with artificial transverse sections exhibit during the period of stimulation a diminution ("negative variation") of their proper current. In uncut muscle the negative value of the diminution or variation becomes algebraically added to whatever current may be already present in the natural termination of the muscle.

Upon these facts du Bois-Reymond had based the following theory:—

1. Muscle- and nerve-fibres contain electromotive molecules suspended in an indifferent conductor, which present positive surfaces to the longitudinal surface or section, and negative surfaces to the transverse surface or section.

2. At the natural terminations of the muscular fibres are arranged particles of a peculiar kind, the presence of which is

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[1] A lecture delivered on February 2, 1878, before the Medical Society of Zurich, by Dr. L. Hermann, Professor of Physiology in the University of Zurich, and published in the "Vierteljahrsschrift d. naturf. Ges. in Zurich," 1878. All the papers referred to in this lecture which have no author's name attached are papers of the author himself.